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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/822,775	03/30/2001	Bahram Javidi	UCT-0017	6972

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EXAMINER

PYZOCHA, MICHAEL J

ART UNIT	PAPER NUMBER
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2137

DATE MAILED: 01/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/822,775

Applicant(s)

JAVIDI ET AL.

Examiner

Michael Pyzocha

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2004.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-142 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-97, 113 and 114 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☒ Claim(s) 98-112 and 115-142 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 30 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 02272002, 03082002.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-142 are pending.

Election/Restrictions

2. Claims 98-112 and 115-142 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected apparatus of forming an image, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 10/25/2004 because no argument about the merits of the election was made.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1-87, 91-92 and 113-114 are rejected under 35 U.S.C. 102(a) as being anticipated by Tajahuerce et al ("Optoelectronic information encryption with phase-shifting interferometry").

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As per claims 1, 14, 59, 72, 85, Tajahuerce et al discloses generating an original set of data; generating a reference set of data; encoding the original set of data; encoding the reference set of data; combining the original set of data with the encoded reference set of data to generate an encrypted set of data (see page 2313); storing the encrypted set; and decrypting the set of data (see page 2315 right side).

As per claims 2-3, 8, 15-16, 21, 60-61, 66, 73-74, 79, 86-87, Tajahuerce et al discloses the encoding of the data comprises phase encoding by introducing a random phase into the data (see pages 2313-2314).

As per claims 4, 17, 62, 75, Tajahuerce et al discloses introducing the random phase using the equation:

$$U_r(x, y; \Delta\phi_r) = A_r(x, y) \exp[i(\phi_r(x, y) + \Delta\phi_r)] \quad (\text{see page 2315}).$$

As per claims 5-6, 18-19, 63-64, 76-77, Tajahuerce et al discloses the encoding of the data comprises amplitude encoding by introducing a random amplitude into the data (see page 2314).

As per claims 7, 20, 65, 78, Tajahuerce et al discloses introducing the random amplitude using the equation:

$$U_r(x, y; \Delta\phi_r) = A_r(x, y) \exp[i(\phi_r(x, y) + \Delta\phi_r)] \quad (\text{see page 2315}).$$

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As per claims 9-10, 22-23, 46, 57, 67-68, 80-81, 91-92, Tajahuerce et al discloses recording the encrypted set of data in a hologram (see page 2315).

As per claims 11, 24, 69, 82, Tajahuerce et al discloses recording the encrypted set in a hologram according to the

$$I_p(x,y) = [A_H(x,y)]^2 + [A_R(x,y)]^2 + 2A_H(x,y)A_R(x,y)\cos[\phi_H(x,y) - \phi_R(x,y) - \Delta\phi_p]$$

wherein p is an integer,

$$\phi_E(x,y) = \phi_H(x,y) - \phi_R(x,y)$$

is the encrypted phase,

$$A_E(x,y) = A_H(x,y)A_R(x,y)$$

equation:

Is the encrypted amplitude $\Delta\phi_p$ is a phase shift between the reference set of data and the original set of data $[A_H(x,y)]^2$ is the intensity of the original set of data and $[A_R(x,y)]^2$ is the intensity of the encoded reference set of data (see page 2315).

As per claims 12-13, 25-26, 70-71, 83-84, Tajahuerce et al discloses the original and reference set of data comprises an optical image, a digitized image, a one dimensional set of data, a two dimensional set of data, a multi-dimensional set of data, an electrical signal or an optical signal (see page 2318).

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As per claim 27, Tajahuerce et al discloses the decrypting of the encrypted set of data comprises generating a set of decryption keys by generating a set of intensity patterns, I'_p , of the combination of the reference beam and a phase shifted reference beam (see page 2315).

As per claims 28-29, Tajahuerce et al discloses the generation of a set of decryption keys includes generating a phase key according to the equation:

$$\phi_k(x, y) = \phi_c - \phi_r(x, y)$$

wherein ϕ_c is a constant $\phi_r(x, y)$ is a random function.

(see page 2315).

As per claims 30-31, Tajahuerce et al discloses the generation of a set of decryption keys includes generating a phase key according to the equation:

$$A_k(x, y) = A_c A_r(x, y)$$

wherein A_c is a constant $A_r(x, y)$ is a random function.

(see page 2315).

As per claims 32-34, Tajahuerce et al discloses generating a decrypted phase according to the equations:

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$$\phi_D(x, y) = \phi_E(x, y) - \phi_K(x, y)$$

wherein $\phi_E(x, y)$ is the encrypted phase and $\phi_K(x, y)$ is the phase key.

$$\phi_D(x, y) = \arctan \left[\frac{(I_4 - I_2)(I'_1 - I'_3) - (I_1 - I_3)(I'_4 - I'_2)}{(I_4 - I_2)(I'_4 - I'_2) - (I_1 - I_3)(I'_1 - I'_3)} \right]$$

wherein I_p are the encrypted set of data and I'_p are the decrypted set of data and p is an integer.

(see page 2315).

As per claims 35-37, Tajahuerce et al discloses generating a decrypted amplitude according to the equations:

$$A_D(x, y) = \begin{cases} \frac{A_E(x, y)}{A_K(x, y)}, & \text{if } A_K(x, y) \neq 0 \\ 0 & \text{otherwise} \end{cases}$$

and

$$A_D(x, y) = \left[\frac{(I_1 - I_3)^2 + (I_4 - I_2)^2}{(I'_1 - I'_3)^2 + (I'_4 - I'_2)^2} \right]^{1/2}$$

wherein I_p are the encrypted set of data and I'_p are the decrypted set of data and p is an integer.

(see pages 2315-2316).

As per claims 38-39, Tajahuerce et al discloses $\phi_E(x, y)$ is expressed as:

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$$\phi_e(x, y) = \arctan\left(\frac{I'_4 - I'_2}{I'_1 - I'_3}\right)$$

is the encrypted phase and said $A_e(x, y)$ is expressed as

$$A_e(x, y) = \frac{1}{4}[(I'_1 - I'_3)^2 + (I'_4 - I'_2)^2]^{1/2}$$

is the encrypted amplitude.

(see page 2315).

As per claims 40-41, Tajahuerce et al discloses $\phi_k(x, y)$ is expressed as:

$$\phi_k(x, y) = \arctan\left(\frac{I''_4 - I''_2}{I''_1 - I''_3}\right),$$

I''_p are the decrypted set of data and p is an integer.

and $A_k(x, y)$ is expressed as:

$$A_k(x, y) = \frac{1}{4}[(I''_1 - I''_3)^2 + (I''_4 - I''_2)^2]^{1/2},$$

I''_p are the decrypted set of data and p is an integer.

(see page 2315).

As per claims 42-45, Tajahuerce et al discloses generating a decrypted hologram to reconstruct the original set of data according to the equation:

$$U_D(x, y) = A_D(x, y) \exp[i\phi_D(x, y)]$$

wherein $A_D(x, y)$ is the amplitude of the decrypted hologram.

(see page 2315).

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As per claim 47, Tajahuerce et al discloses reconstructing the original set of data from the decrypted digital hologram (see page 2316).

As per claim 48, Tajahuerce et al discloses reconstructing of the original set of data from the decrypted digital hologram comprises generating the discrete complex amplitude distribution of the reconstructed original set of data from the equation:

$$U_o(m', n') = \exp \left[\frac{-i\pi}{\lambda d} (\Delta x'^2 m'^2 + \Delta y'^2 n'^2) \right] \sum_{m=0}^{N_x-1} \sum_{n=0}^{N_y-1} U_d(m, n) \\ \times \exp \left[\frac{-i\pi}{\lambda d} (\Delta x^2 m^2 + \Delta y^2 n^2) \right] \exp \left[-i2\pi \left(\frac{m'm}{N_x} + \frac{n'n}{N_y} \right) \right]$$

wherein $U_d(m, n)$ is the discrete amplitude distribution of the decrypted digital hologram, m and n are coordinates in the plane of the hologram, m' and n' are coordinates in the reconstruction plane, Δx is the horizontal resolution in the hologram plane, Δy is the vertical resolution in the hologram plane, $\Delta x'$ is the horizontal resolution in the reconstruction plane, $\Delta y'$ is vertical resolution in the reconstruction plane, N_x is the number of detector pixels in the x direction and N_y is the number of detector pixels in the y direction.

(see page 2316).

As per claims 49-53, Tajahuerce et al discloses generating a discrete complex amplitude distribution of a segment of the original set of data from the decrypted digital hologram

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according to the equation:

$$U'_o(m', n'; \alpha, \beta) = \exp \left[\frac{-i\pi}{\lambda d} (\Delta x'^2 m'^2 + \Delta y'^2 n'^2) \right] \sum_{m'=0}^{N_x-1} \sum_{n'=0}^{N_y-1} U'_D \left(m, n; \frac{\alpha d}{\Delta x}, \frac{\beta d}{\Delta y} \right) \\ \times \exp \left[\frac{-i\pi}{\lambda d} (\Delta x^2 m^2 + \Delta y^2 n^2) \right] \exp \left[-i2\pi \left(\frac{m'm}{N_x} + \frac{n'n}{N_y} \right) \right]$$

(see page 2316).

As per claims 54-56, Tajahuerce et al discloses digitally recording the set of decryption keys in a computer readable medium (see page 2313).

As per claim 58, Tajahuerce et al discloses transmitting the encrypted set of data to remote locations over a distributed computer network (see page 2313 and 2315).

As per claims 113-114, Tajahuerce et al discloses reconstructing the original set of data from the decrypted digital hologram comprises reconstructing the original set of data by digital and optical image processing (see page 2316).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the

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art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 88-90, 93-97 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tajahuerce et al as applied to claims 10, 23, 81, 87, 92 above, and further in view of Ladino ("Data Compression Algorithms").

As per claims 88-90, 93-97, Tajahuerce et al discloses distributing the hologram to remote locations (see pages 2313 and 2315).

Tajahuerce et al fails to disclose compressing and decompressing the hologram on respective ends of the transmission.

However, Ladino discloses compression of data (see pages 1-6).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Ladino's method of data compression to compress the holograms of Tajahuerce et al.

Motivation to do so would have been that compressed data uses less space (see Ladino page 2).

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Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kafri et al (US 4776013) discloses a method and apparatus of encrypting optical images, Jackson (US 5793871) discloses a method and interface for optical encryption, Tomko et al (US 5740276) discloses a method for holographic encryption.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Pyzocha whose telephone number is (571) 272-3875. The examiner can normally be reached on 7:00am - 4:30pm first Fridays of the bi-week off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Caldwell can be reached on (571) 272-3868. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJP

Andrew Caldwell
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